



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-4005**

March 7, 2003

Mr. Stephen M. Quennoz, Vice President  
Power Supply/Generation  
Portland General Electric Company  
Trojan Nuclear Plant  
71760 Columbia River Highway  
Rainier, Oregon 97048

**SUBJECT: NRC INSPECTION REPORT 50-344/2003-001**

Dear Mr. Quennoz:

An NRC inspection was conducted on February 10-13, 2003, at the Trojan Nuclear Plant. This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. The enclosed report presents the results of this inspection. Overall, the inspection found that decommissioning activities were being performed in accordance with procedural and regulatory requirements.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

If you have any questions concerning this inspection, please contact Mr. Robert J. Evans, Senior Health Physicist, at (817) 860-8234 or the undersigned at (817) 860-8191.

Sincerely,

*/RA/*

D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle and Decommissioning Branch

Docket No.: 50-344  
License No.: NPF-1

Enclosure:  
NRC Inspection Report  
050-00344/2003-01

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**ENCLOSURE**

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket No.: 50-344

License No.: NPF-1

Report No.: 50-344/2003-01

Licensee: Portland General Electric Company

Facility: Trojan Nuclear Plant

Location: 71760 Columbia River Highway  
Rainier, Oregon 97048

Dates: February 10-13, 2003

Inspector: Robert J. Evans, P.E., C.H.P., Senior Health Physicist  
Fuel Cycle & Decommissioning Branch

Approved by: D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle & Decommissioning Branch

Attachments: Supplemental Information  
Loaded Holtec Casks at the Trojan ISFSI

ADAMS Entry: IR 05000344-03-01; on 02/10-13/2003; Portland General Electric  
Co.; Trojan Nuclear Plant; Decommissioning Report;  
No violations.

## **EXECUTIVE SUMMARY**

### Trojan Nuclear Plant NRC Inspection Report 50-344/2003-01

This inspection reviewed the core inspection areas associated with a nuclear plant in decommissioning. Overall, the licensee was conducting decommissioning in accordance with procedural and regulatory requirements.

#### **Organization, Management and Cost Controls**

- The licensee had an organization that was in compliance with license requirements. Key positions were filled and sufficient management-level staff was available for decommissioning and fuel handling activities (Section 1.2.a).
- The licensee's quality assurance program met 10 CFR Part 50, Appendix B, requirements. Audits and surveillances were being conducted as stipulated by site procedures. The audits and surveillances were thorough and effective in identifying and correcting potential problems. Corrective action reports were being used to document areas of concern. Corrective action reports indicated that recent incidents were not repetitive in nature (Section 1.2.b).

#### **Safety Reviews, Design Changes, and Modifications**

- The licensee's safety review and design change program was in compliance with 10 CFR 50.59 requirements (Section 2).

#### **Spent Fuel Pool Safety**

- The licensee was maintaining the spent fuel pool within the Permanently Defueled Technical Specification (PDTS) requirements for water level, boron concentration, and water temperature (Section 3).

#### **Decommissioning Performance and Status Review at Permanently Shutdown Reactors**

- Decommissioning activities were being conducted in accordance with license and regulatory requirements. Radiation protection controls and plant systems were in place to support decommissioning activities. The operations shift crew composition met PDTS requirements (Section 4).
- A potential personnel contamination event occurred when a worker was accidentally sprayed with spent fuel pool water when a pump inadvertently started. The cause of the incident was still under investigation by the licensee at the conclusion of the inspection, but preliminary radiological survey results indicated that the worker was not contaminated as a result of the incident (Section 4).

### Occupational Radiation Exposure

- The licensee had an effective exposure monitoring program for internal and external doses to radiation, including a declared pregnant worker. No individual exceeded the regulatory limits for occupational exposures during 2002. Further, no positive bioassays were identified, suggesting that no individual intakes of radioactive material occurred during 2002 (Section 5).
- The licensee began monitoring for neutron exposures when spent fuel handling activities began. The licensee also implemented a program to estimate neutron dose on a daily basis. Cumulative personnel exposures received during initial fuel loading activities exceeded those projected. The licensee was aware of this potentially negative trend and was contemplating corrective actions (Section 5).

### Followup

- The licensee conducted an onsite review of its cranes to ascertain whether a 10 CFR Part 21 notification involving Whiting Cranes was applicable to this site. The Trojan site does not have any Whiting cranes; therefore, this notification was not directly applicable (Section 6).

## Report Details

### Summary of Facility Status

The Trojan Nuclear Plant operated until November 1992. The plant was permanently shutdown during January 1993. The major dismantlement activities have been completed at the site. At the time of this inspection, work in progress included decommissioning and decontamination of the auxiliary and fuel buildings. No final radiological surveys were in progress during the inspection, but the licensee was preparing equipment for use in upcoming embedded piping surveys.

The licensee started moving fuel from the spent fuel pool (SFP) to the first multi-purpose canister MPC-28 on December 31, 2002. At the conclusion of the onsite inspection, four concrete casks, each containing a fully loaded canister, had been moved to the Independent Spent Fuel Storage Installation (ISFSI) pad. A fifth canister had been loaded and was being dried via the vacuum drying system inside the fuel building. The remaining spent reactor fuel was stored in the SFP until eventual transfer into a canister. Fuel loading was scheduled to be completed during late-October 2003.

## **1 Organization, Management, and Cost Controls at Permanently Shutdown Reactors (36801)**

### 1.1 Inspection Scope

The licensee's management organization and controls were reviewed to determine the effectiveness of these controls to maintain compliance with NRC requirements.

### 1.2 Observation and Findings

#### a. Organizational Structure and Management Oversight

During September 2001, the licensee instituted a new organizational structure consistent with Section 5.0, "Administrative Controls," of the Permanently Defueled Technical Specifications. This change was previously approved by the NRC in Amendment 207 dated July 31, 2001, to NRC License NPF-1. Details of the organizational structure are provided in Section 7.1 of the Defueled Safety Analysis Report (DSAR) and in Figure 1.0-1 of the licensee's Nuclear Quality Assurance (QA) Program Manual (licensee document PGE-8010).

The inspector compared the current organizational structure with the DSAR and Nuclear QA Program Manual requirements. The highest ranking onsite staff member was the Trojan general manager. All other departmental managers reported to the general manager. All management-level positions had been filled, and the personnel in those positions had remained in their respective positions since the last inspection of this program area. Sufficient management-level staff was available for the work in progress, including fuel handling activities.

b. QA Program Review

Appendix B to 10 CFR Part 50 states that the licensee shall be responsible for the establishment and execution of a QA program. The inspector reviewed the licensee's implementation of its QA program. In particular, the inspector reviewed selected QA audits and surveillances to ensure that these reviews were being conducted at the required frequencies and to ensure these reviews were thorough and complete.

The inspector reviewed the last two audits of 2002. The audits included final survey activities (Audit No. AP-771) and 10 CFR Part 50 activities (Audit No. AP-770). The two audits appeared thorough and complete. Each audit included checklists and a summary document. The audit program had a mechanism in place to ensure that audit findings were addressed and/or corrected by the respective group or department being audited.

The licensee's surveillance program was also reviewed. The requirements for the QA surveillance program were provided in quality procedure QP 17-11, "Nuclear Oversight Surveillance of Nuclear Division Activities," Revision 1. No particular surveillance schedule or list of surveillances were required by either the license or the licensee's procedures. Procedure QP 17-11 stated that surveillances should be scheduled to provide coverage of quality-related activities and other activities deemed appropriate by management. Additionally, surveillances should be scheduled with emphasis on key areas, such as activities important to the safe storage of irradiated fuel and activities related to removal of radioactive components.

Between January 2002 and February 2003, the licensee conducted 22 surveillances. Most surveillances were related to walkdown of the SFP, although a detailed ISFSI readiness review was conducted as a surveillance during December 2002. Starting late-December 2002, the licensee began conducting weekly joint SFP/ISFSI inspections. Each surveillance concentrated on a specific program area, and the program areas were rotated on a weekly basis. The surveillances were noted to be thorough and provided documented "snapshots" of fuel handling activities. The inspector concluded that the use of the weekly SFP/ISFSI surveillance was a positive practice on the part of the licensee.

The inspector also reviewed selected corrective action reports issued between December 2002 and February 2003. Ten corrective action reports were issued during this time frame. No trends or repeat issues were identified, and the proposed corrective actions appeared appropriate for the circumstances.

1.3 Conclusion

The licensee had an organization that was in compliance with license requirements. Key positions were filled and sufficient management-level staff was available for decommissioning and fuel handling activities. The licensee's QA program met 10 CFR Part 50, Appendix B, requirements. Audits and surveillances were being conducted as stipulated by site procedures. The audits and surveillances were thorough and effective in identifying and correcting potential problems. Corrective action reports were being

used to document areas of concern. Corrective action reports indicated that recent incidents were not repetitive in nature.

## **2 Safety Reviews, Design Changes, and Modifications at Permanently Shutdown Reactors (IP 37801)**

### **2.1 Inspection Scope**

The purpose of this portion of the inspection was to ascertain whether facility design changes, tests, experiments, and modifications were effectively conducted, managed, and controlled during plant decommissioning.

### **2.2 Observation and Findings**

The inspector reviewed the licensee's safety review process to determine whether the program was in conformance with 10 CFR 50.59 requirements. In particular, the inspector reviewed two safety evaluations in detail:

- Safety Evaluation 2002-22, Revision of Seismic Monitoring Instrumentation. This design change authorized the installation of a peak acceleration recorder on the 93-foot elevation of the fuel building near the SFP but deleted seismic instrumentation located in the turbine building, intake structure, control building, and fuel building hot shop. This design change was proposed for several reasons, including difficulties with maintaining operable the original seismic monitors and lack of safety related equipment in the areas where the monitors were previously located. The existing multi-element seismoscope, located on the 45-foot elevation of the fuel building, was not impacted by the change. The inspector concluded that the updated seismic monitor locations were sufficient to monitor and record a seismic event.
- Licensing Document Change Request 2003-03, Use of Nitrogen in MPC Loading Operations. This design change authorized the use of nitrogen in lieu of helium during canister drying operations. Further, the change authorized the use of a heating system to preheat the nitrogen prior to injection into the canister. The inspector noted that nitrogen had been used at other facilities; therefore, this design change was not unique in the industry. The licensee also proposed to use a nominal 9-kilowatt heater to preheat the nitrogen. The licensee's analysis concluded that the predicted fuel cladding temperatures will remain below the existing short term design basis limit of 1058 degrees Fahrenheit although fuel cladding temperatures may increase a "modest" amount, from 659 degrees to 711 degrees. The inspector noted that the ISFSI Safety Review Committee discussed the proposed change at Meeting No. 2003-12. The meeting was held on January 30, 2003. Committee discussion focused on nitrogen temperature and the potential impact on fuel cladding limits. Following discussion, the committee unanimously approved the design change request.

In summary, the inspector concluded that the licensee's 10 CFR 50.59 safety reviews were adequately documented and provided sufficient justification as to why NRC approval was not required prior to implementation of the proposed changes.

### 2.3 Conclusions

The licensee's safety review and design change program was in compliance with 10 CFR 50.59 requirements.

## 3 **Spent Fuel Pool Safety at Permanently Shutdown Reactors (IP 60801)**

### 3.1 Inspection Scope

The inspector verified the safe wet storage of spent fuel, including pool siphon and drain protection; pool instrumentation, alarms, and leakage detection; pool chemistry and cleanliness control; criticality controls; and pool support equipment operation and power supplies.

### 3.2 Observations and Findings

Permanently Defueled Technical Specifications 3.1.1 requires that SFP water level be greater than or equal to 23 feet over the top of irradiated fuel assemblies seated in the storage racks. During the inspection, the pool level was 24 feet, 6 inches. The inspector reviewed the licensee's records for the period of January 2002 through February 2003. The lowest level during that time frame was measured on June 28, 2002, when pool level was 24 feet, 2 inches. Pool level remained above the PDTS limit at all times during 2002-2003.

Technical Specification 3.1.2 requires that the SFP boron concentration be greater than or equal to 2000 parts per million. As of February 10, 2003, the boron concentration was 2186 parts per million. The licensee's pool chemistry records for 2002 and 2003 were reviewed. Boron concentration was lowest on January 7, 2002, at 2098 parts per million. Boron concentration remained above the PDTS limit at all times since January 2002.

The inspector also reviewed other pool chemistry parameters. Two non-PDTS parameters, pH and silica, were above their respective procedurally desired values. As of February 10, 2003, pH was 4.8 with a desired concentration of 4.0-4.7, while silica was 39 parts per million with a desired concentration of less than 21 parts per million. The licensee continued to closely monitor these two non-TS related chemical constituents.

Technical Specification 3.1.3 specifies that the SFP coolant temperature shall be maintained less than or equal to 140 degrees Fahrenheit. The coolant temperature was 81 degrees during the inspection. The highest temperature, observed on August 29, 2002, was 107 degrees due to hotter than normal outdoor temperatures. Since January 2002, pool temperature remained below the PDTS limit.

The inspector conducted a review of SFP makeup sources. The normal makeup was potable/domestic water. Alternate sources included service water, fire protection, and portable pumps. All were available during the inspection. During normal conditions, the plant operators provided makeup water to the SFP to replace fluid lost through leakage or evaporation. The inspector noted that the licensee, in recent weeks, was refilling the pool at about twice the normal rate. This increase in refill rate was a direct result of the volume of fuel being removed from the pool and loaded into MPCs.

### 3.3 Conclusion

The licensee was maintaining the SFP within the PDTS requirements for water level, boron concentration, and water temperature.

## **4 Decommissioning Performance and Status Review at Permanently Shutdown Reactors (71801)**

### 4.1 Inspection Scope

The inspector reviewed the status of decommissioning and evaluated whether the licensee and its contracted workforce were conducting decommissioning activities in accordance with license and regulatory requirements.

### 4.2 Observation and Findings

Plant tours were conducted to observe decommissioning activities. Decontamination activities were in progress in the fuel and auxiliary buildings. The decommissioning work included remediation of potentially contaminated concrete. The work was being conducted in a safe and orderly manner. Radiological controls, including postings and barriers were in place as needed in the areas where decommissioning activities were in progress. The inspector noted good housekeeping and fire protection practices.

Technical Specification Table 5.2.2-1 lists the minimum shift crew composition. During plant tours, the inspector made unannounced visits to the control room. Control room and plant operations staffing met the minimum crew composition as specified in PDTS.

During the inspection, one recent incident was reviewed. On January 27, 2003, during performance of ISFSI water transfer operations, one worker was accidentally sprayed with SFP water when a water transfer pump unexpectedly started. This resulted in an unintended discharge of borated water from the multi-purpose fill hose and onto a worker in the restricted area of the fuel building. The worker immediately removed his protective clothing, left the area, and conducted a whole body scan. The whole body scan indicated that the worker had not been contaminated with radioactive material on his body. Corrective actions included issuance of a corrective action report and shift crew briefings. At the end of the inspection period, the incident was still under review by the licensee. The inspector concluded that immediate corrective actions were taken by the licensee to prevent recurrence of the incident.

#### 4.3 Conclusion

Decommissioning activities were being conducted in accordance with license and regulatory requirements. Radiation protection controls and plant systems were in place to support decommissioning activities. The operations shift crew composition met TS requirements. A potential personnel contamination event occurred when a worker was accidentally sprayed with SFP water when a pump inadvertently started. The cause of the incident was still under investigation by the licensee at the conclusion of the inspection, but preliminary radiological survey results indicated that the worker was not contaminated as a result of the incident.

### 5 **Occupational Radiation Exposure (IP 83750)**

#### 5.1 Inspection Scope

The inspector reviewed records and interviewed personnel to ensure that occupational radiation exposures for calendar year 2002 were within the limits specified in 10 CFR Part 20.

#### 5.2 Observation and Findings

The inspector reviewed the occupational exposure records for calendar year 2002. Occupational exposures typically consist of both external and internal exposures. To measure external exposures, plant personnel entering the radiologically restricted areas were assigned both thermoluminescent dosimeters (TLDs) and digital alarming dosimeters. The licensee maintained records of external exposure based on dosimeter readings until the quarterly TLD results were available.

During 2002, 329 workers were monitored for external exposures. Thirteen workers had measurable quantities of external exposure. The highest external exposure was 169 millirems, and the second highest exposure was 122 millirems. All exposures were well below the 5000-millirem total effective dose equivalent limit established in 10 CFR 20.1201. As a comparison, the highest total effective dose equivalent for calendar year 2001 was 308 millirems.

Whole body counting and in-vitro bioassays were used to detect the presence of radioactive material in the body. During 2002, 402 whole body counts and 5 in-vitro bioassays were conducted. There were no positive bioassays, meaning that no individual was detected with a measurable amount of radioactive material in or on their bodies. As a result of the bioassay program results, no internal occupational doses were assigned to workers. All occupational doses assigned during 2002 were based on TLD results.

The licensee had one declared pregnancy worker during calendar year 2002. This individual declared her pregnancy during July 2002. Her exposure for 2002 was 0.0 millirems (no dose received) based on her TLD results. The inspector noted that the licensee also conducted monthly whole body counts of this worker to monitor for

potential uptakes of radioactive material. In summary, the dose to the embryo/fetus was well below the regulatory limit specified in 10 CFR 20.1208.

Effective during the first quarter of 2003, TLDs were issued to plant workers that also monitored for neutron exposure. Monitoring of neutron exposure was necessary because of spent fuel handling activities that commenced on December 31, 2002. Since the TLDs were exchanged on a quarterly basis, the licensee implemented a program for estimating neutron exposures. A neutron dose tracking log was used to estimate doses on a daily basis until analysis of the quarterly TLDs was complete. The inspector noted that the licensee's method for tracking, logging, and estimating neutron doses was conservative and would most likely over-estimate the actual neutron dose.

The work activity for 2003 that had the highest occupational exposure potential was loading of the canisters with spent fuel. The licensee set exposure goals for each canister based on the fuel loading pattern designated for that canister. At the conclusion of the onsite inspection, the licensee had completed the loading of four canisters. Based on preliminary estimates, the loading of the first four canisters resulted in a total dose of 2.57 person-rems. In particular, the welding, vacuum drying, and non-destructive examination processes were resulting in more exposure than originally anticipated. The licensee was contemplating corrective actions to reverse this potentially negative trend.

### 5.3 Conclusion

The licensee had an effective exposure monitoring program for internal and external doses to radiation, including a declared pregnant worker. No individual exceeded the regulatory limits for occupational exposures during 2002. Further, no positive bioassays were identified, suggesting that no individual intakes of radioactive material occurred during 2002. The licensee began monitoring for neutron exposures when spent fuel handling activities began. The licensee also implemented a program to estimate neutron dose on a daily basis. Cumulative personnel exposures received during initial fuel loading activities exceeded those projected. The licensee was aware of this potentially negative trend and was contemplating corrective actions.

## 6 **Followup (92701)**

### 6.1 Followup of 10 CFR Part 21 Notification

On January 29, 2003, the NRC received notification (Event No. 39545) from Whiting Corporation regarding a potential problem with its heavy lift cranes. This notification was related to Whiting Cranes sold to utility companies prior to 1980. The concern was specific to the Whiting #25 hoist unit gear case.

The licensee conducted a review of onsite cranes to ascertain whether the notification was applicable to this site. The engineering department determined that there were no Whiting Cranes onsite; therefore, the Part 21 notification was not directly applicable to the Trojan facility.

The licensee's fuel building crane was manufactured by Crane Manufacturing Services. According to the licensee's documentation, the crane had been load tested to 125 percent of rated capacity at least three times; in 1972 following installation, in 1997 following modifications to the main hook and to support ISFSI fuel load preparations, and in 2002 following replacement of the crane hook load pins. The licensee has certifications documenting that the crane meets the appropriate standards (CMAA 070 and ANSI B30.2).

## **7 Exit Meeting Summary**

The inspector presented the inspection results to members of licensee management and staff at the exit meeting on February 13, 2003. During this inspection, the licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

**ATTACHMENT 1**

**SUPPLEMENTAL INFORMATION**

**PARTIAL LIST OF PERSONS CONTACTED**

Portland General Electric

K. Cox, ISFSI Manager  
L. Dusek, Plant Support Manager  
M. Lackey, Trojan General Manager  
T. Meek, Radiation Protection Manager  
J. Mihelich, Engineering Manager  
S. Nichols, Decommissioning Projects Manager  
J. Vingerud, Nuclear Oversight Manager

**ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened

None

Discussed

None

Closed

None

**LIST OF ACRONYMS**

DSAR	Defueled Safety Analysis Report
ISFSI	Independent Spent Fuel Storage Installation
MPC	multi-purpose canister
PDTS	Permanently Defueled Technical Specifications
QA	quality assurance
SFP	spent fuel pool
TLD	thermoluminescent dosimeter

## ATTACHMENT 2

### LOADED HOLTEC CASKS AT THE TROJAN ISFSI

LOADING ORDER	CASK # (MPC #)	DATE PLACED ON PAD	HEAT LOAD <sup>1</sup> (kilowatts)	BURNUP <sup>2</sup> MWd/MTU	FUEL <sup>3</sup> ENRICHMENT	MANHOURS TO LOAD	PERSON-REM DOSE
1	28	1/03	6.4 (4.1)	39,919	3.56	2,452	0.236
2	26	1/03	6.9 (4.7)	38,877	3.56	2,035	0.238
3	35	2/03	17.4 (14.3)	41,889	3.46	1,630	1.145
4	11	2/03	15.9 (12.9)	41,278	3.20	Not Available	0.950
5	18	2/03	15.4	39,966	3.45	Not Available	0.905

Notes:

1. Heat Load is the sum of the heat load values for all 24 spent fuel assemblies. Heat load was calculated based on 1/1/98. For the first four casks, the value in parenthesis is the corrected value for 1/1/03.
2. Burnup is the value for the spent fuel assembly with the highest individual discharge burnup.
3. Fuel Enrichment is the spent fuel assembly with the highest individual enrichment in per cent of U-235.